Foreword

One of the most important tools the Nation's energy policymakers rely on is forecasts from models that simulate the workings of our domestic petroleum industry. These models can provide policymakers with forecasts of the supplies and prices of natural gas and crude oil that will be available to the Nation under various economic, regulatory, and resource scenarios. This information not only helps the policymakers to see what the likely energy future is for the Nation, it also helps them understand how their policy decisions can affect that future.

Today's crude oil and natural gas supply models provide detailed simulations of all the major engineering, economic, regulatory, and resource features of the petroleum industry. One of the most important features of these models is a detailed and accurate description of the Nation's petroleum resource base and the rate at which this resource base is being depleted.

Depletion of nonrenewable energy resources, such as natural gas and oil, is a natural result of producing and consuming these resources. In this process, there is a tendency to find and produce the largest, least-costly resources first, leaving harder-to-find and more costly resources for later development. From a national energy policy perspective, the phenomenon of depletion is important because future supplies and prices of natural gas and oil will be directly affected by the rate of resource depletion and the quality and quantity of the resources remaining to be developed. [1]

In March 1999, the Office of Fossil Energy (FE), within the U.S. Department of Energy (DOE), was approached by six trade associations representing many domestic petroleum companies. The associations were concerned that modeling forecasters may be underestimating the rate at which our domestic petroleum resources are being depleted. This would have the effect of making their forecasts overly optimistic in the sense of forecasting abundant supplies of oil and natural gas at lower-than-realistic prices. In response to this concern, FE asked the Energy Information Administration (EIA), within DOE, to explain how they simulated depletion in their national energy forecasting model,[2] and also to analyze an "accelerated depletion" scenario in which oil and natural gas resources were being depleted at a faster rate than assumed in their model.

In a series of meetings with FE and the trade associations, EIA provided detailed descriptions of how they tracked and calculated the rate of depletion of our domestic petroleum resources, and how they represented depletion in their models. FE also used those meetings to develop an "accelerated depletion" scenario that EIA agreed to analyze.

The results of that analysis showed that, if depletion was actually occurring at a faster rate than expected by EIA, future domestic production of natural gas and oil would be at lower rates than forecast in EIA's *Annual Energy Outlook*. The accelerated depletion scenario also showed significantly higher prices for natural gas than EIA's reference case from the *Annual Energy Outlook*.

EIA also ran a number of sensitivity analyses for the accelerated depletion case to highlight what events might offset the effects of accelerated depletion. While the results of these sensitivity runs varied widely, the factor which emerged as having the greatest impact on resource depletion was technology. When technology was assumed to improve faster than EIA assumes in its reference case, the negative effects of accelerated depletion were significantly lessened. Conversely, when technology was assumed to improve at a slower rate than EIA assumes in its reference case, the effects of accelerated depletion were significantly worse.

It should be noted that the accelerated depletion scenario and all the sensitivity cases analyzed by EIA were defined by FE in conjunction with the industry. The changes made to parameters in the model to simulate these "what if" cases were based solely on expert opinion and anecdotal information, and should be viewed as such. These modeling changes are not supported by statistically validated information and should not be considered as viable alternatives to the corollary assumptions in EIA's model. Some of these changes even have directional impacts that offset each other in the time frame considered. Thus, the results of these analyses should be viewed as products of those assumptions showing general trends and should not be treated as quantitative forecasts of expected industry behavior, technological advances, or petroleum reserves.

[1]The effects of resource depletion can be slowed, neutralized, or possibly even reversed by advances in the technologies used to find and produce these resources. New technologies enable the industry to more efficiently and cost-effectively find and produce our natural gas and oil resources. The extent to which advances in technology can offset depletion depend on the rate of development of new technologies balanced against the natural depletion of the resource.

[2]EIA's model is the National Energy Modeling System (NEMS). NEMS is widely used by Government and industry energy analysts for forecasts of future supplies and prices of all forms of energy, including crude oil and natural gas.